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Title of the Invention: Sterilizing Device for Blowing and Injection Mandrel Station of Plastic Container Molding Machine
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Specification

1. Title of the Invention

Sterilizing Device for Blowing and Injection Mandrel Station of Plastic Container Molding Machine

2. Scope of Claim for Patent

A sterilizing device for a blowing and injection mandrel station of a plastic container molding machine, characterized by the fact that the sterilizing device surrounds the lower end part of a mandrel for blowing and injecting, has a hole through which the mandrel can freely pass when descending, provides a sterile chamber in the vicinity of an upper surface of a mold device, and supplies sterilized pressurized air to the sterile chamber to form a sterilized atmosphere between the mandrel and the upper surface of the mold device.

3. Detailed Explanation of the Invention

The present invention relates to a sterilizing device for a blowing and injection mandrel station of a plastic container molding machine. A plastic container molding machine is a machine with which a series of processes of melting a synthetic material to form a plastic container, filling a sterile filling material, such as a fluid food or a pharmaceutical product for

example, in this container, and thereafter, sealing the opening of the container, can be repeatedly carried out. In this machine, a mold for molding is used, an integrated blowing and injection mandrel is moved up and down, a plastic container is blow-molded inside the mold, and then, a filling material is filled into the plastic container and the plastic container is sealed.

Conventionally, a manufacturing method involving processes whereby a plastic container was manufactured with a molding machine, and then that plastic container was cleaned and sterilized, carried into a clean room, a sterile filing material was injected therein, and the plastic container was sealed, was used. That method had the following disadvantages: it required a lot of space for equipment and equipment cost, and it required many man-hours for transfer, etc. Moreover, the molding machines that performed molding and filling in the same machine could not be used for sterile filling material because there were no sterilized machines.

The objective of the present invention is to remove these disadvantages, to prevent contamination of the plastic container by the mandrel etc. by enveloping the front end part and the peripheral part of the blow and injection mandrel that is moved up and down, and the area surrounding the upper opening of the mold in an atmosphere of a sterilized air, and thereby to provide a sterilizing device for a blowing and injection mandrel station of a plastic container molding machine that could render a conventional clean room unnecessary. An embodiment of the present invention will be explained below with reference to the drawings.

An outline of the structure of a plastic container molding machine wherein the device of the embodiment has been mounted is shown in Figure 1. The plastic container molding machine comprises a parison extrusion device (1), a molding and filling

device (2) and a mold device (3). In the parison extrusion device (1), a granular synthetic material poured into a hopper (4) is melted, and extruded from an extrusion head (5) as a hollow tubular parison (6). Sterilized pressurized air, the pressure of which has been lowered, is blown into the hollow part of the parison (6) from an air-supply opening (7). The parison (6), which was extruded at a given length, is held by dies (8) and (8) of the mold device (3). The lower end part is sealed and at the same time, the upper part is held by the holding members (8a) of the die (8), and the parison (6) is cut by a cutter (9), and as shown in Figure (b), the mold device (3) moves to the blowing and injection mandrel station beneath the blow-molding and filling head (10) of the molding and filling device (2). Up to the point when the lower end part of the parison (6) is sealed and the parison (6) is cut by the cutter (9), it is inflated slightly by the pressurized air, and an inflow of the external air into the parison is prevented by the release of air from the opening during the transfer of the molding device (3). The lower end part of a blowing and injection mandrel (11) provided in the blow-molding and filling head (10) in such a way that it can freely move up and down, is positioned at the ascent limit in a sterile chamber (12), which surrounds the vicinity of the lower end part of the blowing and injection mandrel (11). The hole in the sterile chamber (12) through which the blowing and injection mandrel (11) rises and descends, is provided close to the opening of the parison (6) held in the mold device (3), and according to a mechanism explained later, the sterilized, pressurized air supplied to the sterile chamber (12) is blown out and external air is thereby prevented from flowing into the parison (6). The blowing and injection mandrel (11) descends, and when the parison (6) is held in an airtight manner between the dies (8), sterilized, pressurized air is

blown in through an air-supply and exhaust opening (13), and the parison (6) is formed into a container (14) along the inside of the die (8). Then, a given quantity of filling material of a tank (15) is pumped out by a measuring cylinder device (16) driven by a hydraulic cylinder, and filled into the container (14) from an injection mandrel (18) built into the blowing and injection mandrel (11), via a hose (17). Then, the opening of the container (14) is sealed by a closer (19) of the mold device (3).

The structure of the sterile chamber (12), and the air circuit and steam circuit connected thereto are shown in Figure 2. In the sterile chamber (12), a hole through which the blowing and injection mandrel (11) can ascend and descend with a slight play, has been opened, and below it, the top surface of the mold device (3), which has moved there, is stopped close to the sterile chamber (12). A duct chamber (12a) can be partitioned off in the sterile chamber (12) with a shutter (12), the opening and closing of which can be controlled. A supply-air circuit open to the external air via a sterilized filter (21), a control valve (22), an air compressor (23) and an intake air filter (24); and a sterilization circuit formed when the shutter (20) and the control valve (22) are closed, connected to a pressurized steam source (26) via a control valve (25), and open to a drain via a control valve (27) and a steam flap (28), are connected to the sterile chamber (12). Both the sterilized filter (21) and the intake air filter (24) are filters that can sterilize the air, for example filters that do not allow dust of 0.2 μ or larger to pass through. Pressurized steam of about 138°C is supplied from the pressurized steam source (26). The steam flap (28) closes at about 125°C, and at temperatures lower than that, it is continuously open and discharges steam and condensate thereof. Therefore, if pressurized steam is flown through the

sterilization circuit, the circuit and the vicinity thereof reaches a temperature of at least 121°C, the temperature required for sterilization, and are thus sterilized.

Next, the operation of the device will be explained. As shown in Figure 2 and Figure 3, before the start of production, the shutter (20) and the control valve (22) are closed, and the control valves (25) and (27) of the sterilization circuit are opened. All of these operations are carried out through remote control. When pressurized steam is released to the sterilization circuit from the pressurized steam source (26) and the steam flap (28) closes at about 125°C, the sterilization circuit and the area in the vicinity thereof, including the sterile chamber (12), as far as the control valve (22), are sterilized. When the steam flap (28) closes, the pressurized steam source (26) switches to a sterilized pressurized air source (not shown in the diagram.) When, after the elapse of a little time, the temperature of the steam flap (28) falls and the steam flap (28) opens, pressurized air flows to the sterilization circuit, drives out condensate remaining in the circuit, and dries and cools the circuit. The control valves (25) and (27) are closed, the shutter (20) and the control valve (22) are opened, and at the same time, the air compressor (23) is activated, sterilized air is supplied to the sterile chamber (12) and blown out of the hole thereof. Then, the production of the plastic container starts, the blowing and injection mandrel (11) descends into the opening of the parison (6) held in the mold device (3) that has moved, and seals the opening. Then, as shown in Figure 3(a), a sterilized pressurized air is supplied through the air-supply and exhaust opening (13), the parison (6) is inflated along the die (8) and blow-molded into the container (14). Then, the injection mandrel (18) descends slightly, the valve on the front end is opened and the filling

material is injected into the container (14).

When the injecting is finished, as shown in Figure (b), the blowing and injection mandrel (11) goes up; and as shown in Figure (c), the opening of the container (14) is sealed by the closer (19). Meanwhile, the sterilized pressurized air blown out from the sterile chamber (12) envelops the area around the mandrel (11), and the space between the molding device (3) and the sterile chamber (12), prevents the inflow of the external air, and thereby prevents the contamination of the parison (6) and the container (14) by the external air. The completely finished container (14) shown in Figure (c) is taken out when the die (8) is opened, and the mold device (3) goes back to the parison extrusion station. The above steps are repeated, and containers (14) in which sterile filling material has been filled are produced continuously.

As is clear from the above explanation, according to the present invention, a sterile chamber is provided in a blowing and injection mandrel station, and as the area around the blowing and injection mandrel and the space above the mold device can be enveloped in a sterile atmosphere by the sterilized air blown out from the sterile chamber, the blow-molding of plastic containers and the operation of filling a sterile filling material can be performed as a series of processes at the same work station; and from a practical perspective, the effects and benefits of this device are very significant including the fact that much equipment space, equipment cost and man-hours can be saved, etc.

4. Brief Explanation of the Drawings

Figure 1 (a) and (b) are drawings explaining an outline of the structure of a plastic container molding machine.

Figure 2 is a drawing showing the structure of an embodiment and the piping circuit thereof.

Figure 3 (a), (b) and (c) are drawings explaining the processes and the operation of the embodiment.

1: parison extrusion device
2: molding and filling device
3: mold device
4: hopper
5: extrusion head
6: parison
7: air-supply opening
8: die
8a: holding member
9: cutter
10: blow-molding and filling head
11: blowing and injection mandrel
12: sterile chamber
12a: duct chamber
13: air-supply and exhaust opening
14: container
15: tank
16: measuring cylinder device
17: hose
18: injection mandrel
19: closer
20: shutter
21: sterilized filter
22: control valve
23: air compressor
24: intake air filter
25: control valve